Attachments to the Fact Sheet for VA0083411
Wilderness WWTP

Attachment 1	Flow Frequency Determination
Attachment 2	Facility Process Flow Diagram
Attachment 3	Topographic Map
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Attachment 5	Planning Statement
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Attachment 7	Effluent pH and Total Hardness Data
Attachment 8	Dissolved Oxygen Model
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Attachment 10	Whole Effluent Toxicity Data Summary and Endpoint Derivation
Attachment 11	Public Notice

Attachment 1

January 11, 2011
MEMORANDUM

TO: VPDES Reissuance File VA0083411

FROM: Alison Thompson

SUBJECT: Flow Frequency Determination of VPDES Permit No. VA0083411
Wilderness WWTP

COPIES:

This Flow Frequency determination supersedes the determination done in April 2006 as part of the 2006 permit reissuance. The flow frequency values for the gage stations were updated in mid-2006. As in 2006, staff adjusted the updated stream flows with the maximum withdrawal of 2.0 MGD allowed by VWP Permit 96-0271. The flow frequencies at the outfall location shall be determined using values at the Rapidan River gaging station (#01667500) at Culpeper, Virginia, and adjusting them by proportional drainage areas.

Rapidan River near Culpeper, VA (#01667500)

Drainage area	=	472 sq. mi.
1Q10	=	11 cfs
7Q10	=	16 cfs
30Q5	=	44 cfs
30Q10	=	27 cfs
High flow 30Q10	=	119 cfs
High flow 1Q10	=	66 cfs
High flow 7Q10	=	89 cfs
HM	=	161 cfs

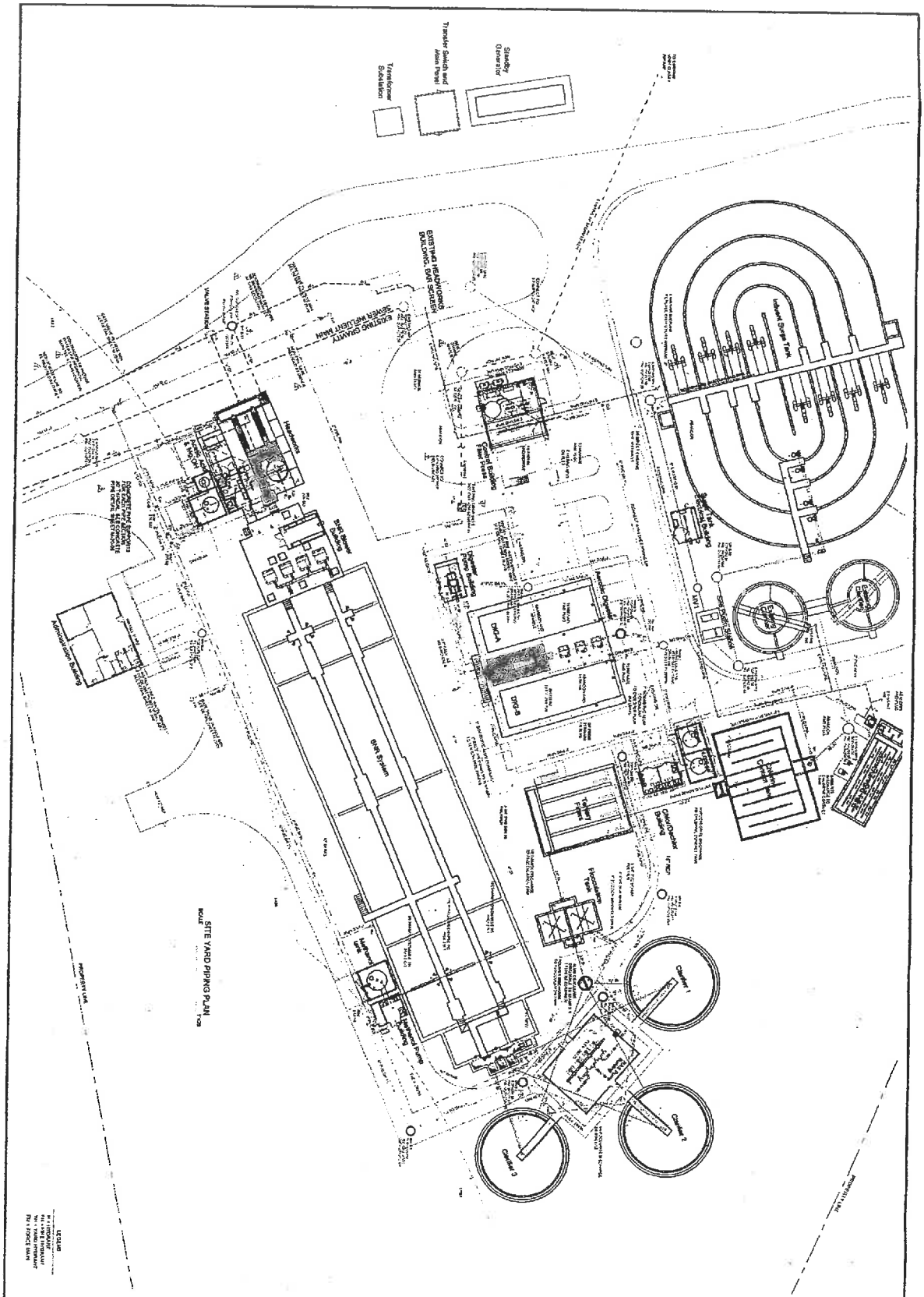
Rapidan River at the discharge point

Drainage area	=	640 sq. mi.	
1Q10	=	14.9 cfs	9.6 – 2.0 = 7.6 MGD
7Q10	=	21.7 cfs	14 – 2.0 = 12 MGD
30Q5	=	59.7 cfs	38.6 – 2.0 = 36.6 MGD
30Q10	=	36.6 cfs	23.7 – 2.0 = 21.7 MGD
High flow 30Q10	=	161.4 cfs	104.3 – 2.0 = 102.3 MGD
High flow 1Q10	=	89.3 cfs	57.7 – 2.0 = 55.7 MGD
High flow 7Q10	=	121 cfs	78 – 2.0 = 76 MGD
HM	=	218 cfs	141 – 2.0 = 139 MGD

The high flow months are December - May

Attachment 1

Attachment 2



C-02-04

WILDERNESS BIOLOGICAL NUTRIENT REMOVAL
PUBLICLY OWNED TREATMENT WORKS (POTW)
ORANGE COUNTY, VIRGINIA

SITE PLAN
SITE YARD PIPING PLAN

NO	REVISIONS	BY	DATE
1	NEW NOTES ADDED	LDD	5-25-05
2	CONCRETE PIPES SUPPORT SHOWN ELSEWHERE SHOWN	MD	9-26-05
3	RELOCATED BAR 8-11 AND REVISED ASSOCIATED PIPING	GRH	12-7-05

REVISED IN ACCORDANCE with CONSTRUCTION RECORDS

Applied Technology and Engineering
545 Panorama Pa. Corbyville, Va 22936
Phone: (434)-978-1422 Fax: (919)-882-5410

Attachment 2

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHERN REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193
(703) 583-3800 Fax (703) 583-3821
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Thomas A. Faha
Regional Director

October 3, 2011

Orange County
Wilderness STW
VA 0083411

Mr. Dudley Pattie
General Manager
Rapidan service Authority
11235 Spotswood Trail
Ruckersville, VA 22968

Dear Mr. Pattie:

Enclosed is the Certificate to Operate (CTO) for the above mentioned facility. This action is in accordance with the Virginia *Sewage Collection and Treatment Regulations.*

If you have any questions regarding the CTO, please feel free to contact this office.

Sincerely,

JS Desai

J. S. Desai, P. E.
CBP/Wastewater Engineering
Northern Regional Office

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CERTIFICATE TO OPERATE

Owner: Orange County

Facility/System Name: Wilderness Wastewater Treatment Plant

VPDES Permit Number: VA0083411

Description of the Facility/System:

The project consists of conversion of the existing oxidation ditch to an equalization basin; installation of headworks including screening and grit removal; construction of a 3 train bioreactor with anaerobic, preanoxic, aerobic, post anoxic, and reaeration zones; 3 secondary clarifiers; flash mix with dual flocculation basins; upflow continuous backwash tertiary filters; chlorine contact tanks; post aeration; drum thickener; two aerobic digesters; two plate and frame presses(1 new/1 existing); chemical feed and storage systems for acetic acid, methanol, magnesium hydroxide, alum, sodium hypochlorite, bisulfate, and polymer; and other miscellaneous upgrades including the electrical systems.

The project is designed to comply with average monthly effluent limits of 8/20 mg/l cBOD5 (Jun-Nov/Dec-May); 8/20 mg/l TSS(Jun-Nov/Dec-May); 3.0/7.0 mg/l TKN(Jun-Nov/Dec-May); 65 µg/l Total Recoverable Zinc; pH range of 6.0-9.0 S.U.; 126 n/100 ml E. coli (geometric mean) or 0.009 mg/l TRC, and minimum DO of 6.0 mg/l.(It should

be noted that change in values noted for Copper, Zinc and TRC from the initial June 24,2009 CTC issuance reflect the VPDES permit limits established in the August 18,2011 permit reissuance). Additionally, the project is designed to meet an annual average total nitrogen concentration of 3.0 mg/l and an annual average total phosphorus concentration of 0.3 mg/l.

Authorization to Operate:

The owner's consulting engineer has certified in writing by letters dated August 29, 2011 that the installation has been constructed as per the approved plans and specifications. Therefore, the owner has authorization to operate the 2.0 MGD facility.

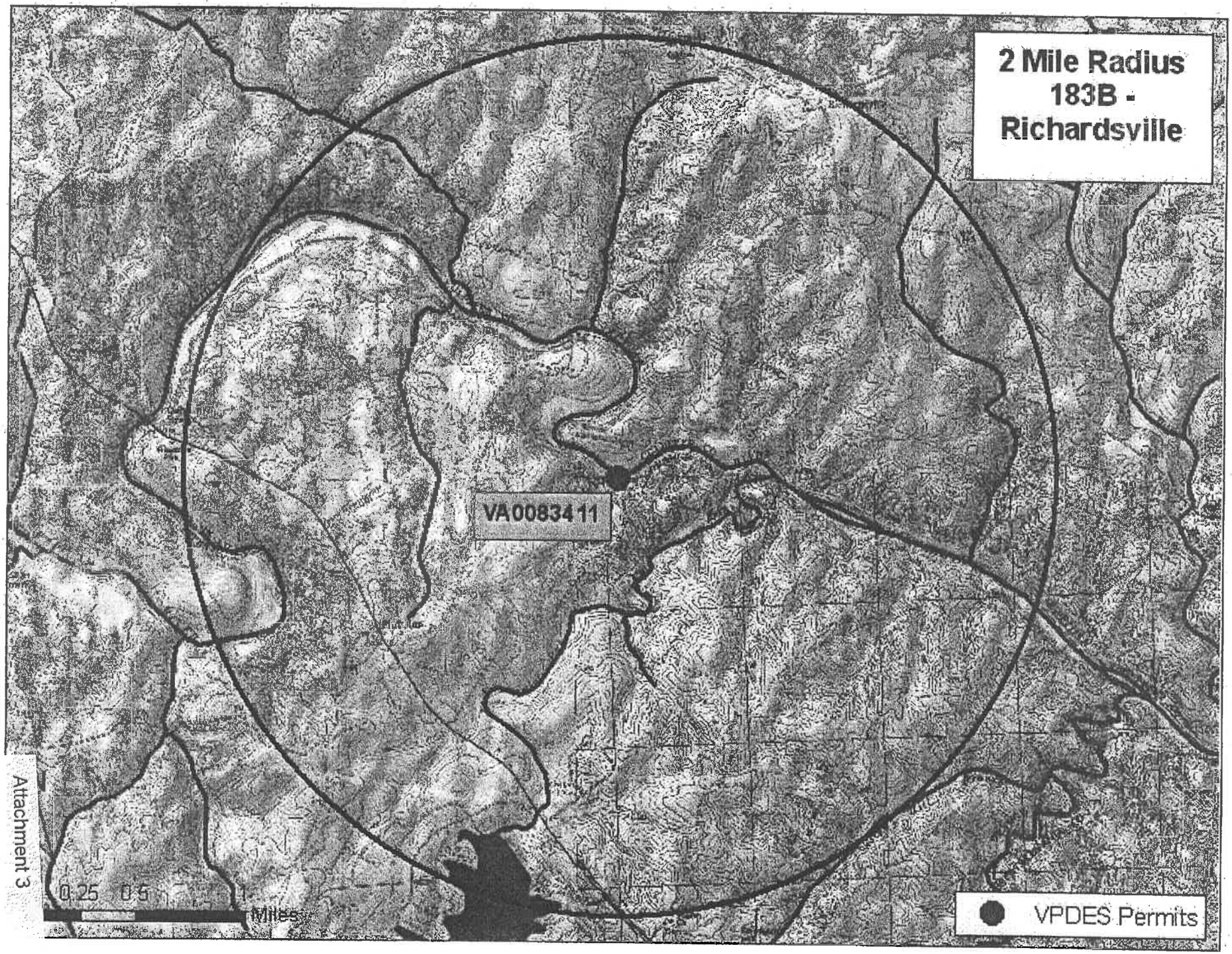
ISSUANCE:

J.S. Desai

J.S. Desai, P. E.,
DEQ-CBP/Wastewater Engineering

Date: October 3, 2011

Attachment 3



Attachment 3

Attachment 4

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHERN REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193

(703) 583-3821 Fax (703) 583-3821
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

Thomas A. Faha
Regional Director

December 5, 2014

Mr. Timothy Clemons
Assistant General Manager
Rapidan Service Authority
P.O Box 148
Ruckersville, VA 22968

Re: **Wilderness WWTP Inspection-Permit VA0083411**

Dear Mr. Clemons:

Attached is a copy of the Inspection Report generated while conducting a Facility Technical and Laboratory Inspection at the Wilderness WWTP on October 28, 2014. This letter is not intended as a case decision under the Virginia Administrative Process Act, Va. Code § 2.2-4000 *et seq.* (APA). The compliance inspection staff would like to thank Mr. Tim Clemons for his time and assistance during the inspection.

Please note the requirements and recommendations addressed in the technical summary, and submit in writing, a progress report to this office by January 05, 2014. Your response may be sent either via the US Postal Service or electronically, via E-mail. If you choose to send your response electronically, we recommend sending it as an Acrobat PDF or in a Word-compatible, write-protected format. Additional inspections may be conducted to confirm the facility is in compliance with permit requirements.

If you have any questions or comments concerning this report, please feel free to contact me at the Northern Regional Office at (703) 583-3801 or by E-mail at Lisa.Janovsky@deq.virginia.gov.

Lisa Janovsky
Environmental Specialist II

cc: Permit/DMR File;
Water Compliance Manager

	Receiving Stream	**Rapidan River**	
	Basin	**Rappahannock River**	
	Discharge Point (LONG)	**38° 22' 30"**	
	Discharge Point (LAT)	**77° 44' 45"**	

VPDES NO. **VA0083411**

DEQ
WASTEWATER FACILITY
INSPECTION REPORT
PART 1

Inspection date: **10/28/2014**

Date form completed: **12/02/2014**

Inspection by: **Lisa Janovsky**

Inspection agency: **DEQ**

Total Time Spent: **55 hours**

Announced: **No**

Reviewed by: Ed L. Stuart

Scheduled: **Yes**

Present at inspection **Amy Dooley-DEQ**
Ed Stuart-DEQ
John Thompson-DEQ
Tim Clemons and Alex Repnikov-Rapidan Service Authority

TYPE OF FACILITY:

Domestic
[ ] Federal
[X] Nonfederal
[X] Major
[ ] Minor

Industrial
[ ] Major
[ ] Minor
[ ] Primary
[ ] Secondary

Type of inspection:

[X] Routine
[ ] Compliance/Assistance/Complaint
[ ] Re-inspection

Date of last inspection: **October 28, 2011**
Agency: **DEQ NRO**

Population served: approx. **15,000** Connections served: approx. **3,950**

Last month: (Influent) **September 2014**

$CBOD_5$: **145 mg/L** TSS: **101 mg/L**

Last month: (Effluent) **September 2014**

Flow:	**0.685**	MGD	pH	**7.8**	SU	D.O.	**9.9**	mg/L
$CBOD_5$	**<QL**	mg/L	TSS	**<QL**	mg/L	E.coli	**1**	n/100mls
TN	**1.12**	mg/L	TKN	**0.93**	mg/L	TP	**0.13**	mg/L

Quarter average: (Effluent) **July-September 2014**

Flow:	**0.674**	MGD	pH	**7.9**	SU	D.O.	**8.5**	mg/L
$CBOD_5$	**<QL**	mg/L	TSS	**1.4**	mg/L	E.coli	**2**	n/100mls
TN	**1.21**	mg/L	TKN	**1.02**	mg/L	TP	**0.59**	mg/L

(A) PLANT OPERATION AND MAINTENANCE

1. Class and number of licensed operators: I -3 II - 0 III - 0 IV - 2 Trainee - 0

2. Hours per day plant is manned: **10 hours/day 7 days/week**

3. Describe adequacy of staffing. [ ] Good [X] Average [ ] Poor

4. Does the plant have an established program for training personnel? [X]Yes [ ] No

5. Describe the adequacy of the training program. [X] Good [ ] Average [ ] Poor

6. Are preventive maintenance tasks scheduled? [X]Yes [ ] No

7. Describe the adequacy of maintenance. [ ] Good [X] Average [ ] Poor*

8. Does the plant experience any organic/hydraulic overloading?
   If yes, identify cause and impact on plant: [ ] Yes [X] No

9. Any bypassing since last inspection? [ ] Yes [X] No

10. Is the standby electric generator operational? [X] Yes [ ] No* [ ] NA

11. Is the STP alarm system operational? [X] Yes [ ] No* [ ] NA

12. How often is the standby generator exercised? **Once per week**
    Power Transfer Switch? **Once per week**
    Alarm System? **Self-diagnostic once/week (SCADA system)**

13. When was the cross connection control device last tested on the potable water service? **November 2014**

14. Is sludge being disposed in accordance with the approved sludge disposal plan? [X] Yes [ ] No [ ] NA

15. Is septage received by the facility? [ ] Yes [X] No
    Is septage loading controlled? [ ] Yes [ ] No
    Are records maintained? [ ] Yes [ ] No

16. Overall appearance of facility: [X] Good [ ] Average [ ] Poor

Comments:

(C) SAMPLING

1. Do sampling locations appear to be capable of providing representative samples? [X] Yes [ ] No*
2. Do sample types correspond to those required by the VPDES permit? [X] Yes [ ] No*
3. Do sampling frequencies correspond to those required by the VPDES permit? [X] Yes [ ] No*
4. Are composite samples collected in proportion to flow? [X] Yes [ ] No* [ ] NA
5. Are composite samples refrigerated during collection? [X] Yes [ ] No* [ ] NA
6. Does plant maintain required records of sampling? [X] Yes [ ] No*
7. Does plant run operational control tests? [X] Yes [ ] No

Comments:
- **None**

(D) TESTING

1. Who performs the testing? [X] Plant [ ] Central Lab [X] Commercial Lab

   Name:
   - **Environmental Systems Service, LTD tests CBOD, BOD, TSS,TKN, NO_2/NO_3, Total P, E. Coli, Copper, Zinc and Sludge**

If plant performs any testing, complete 2-4.

2. What method is used for chlorine analysis? **HACH DPD-Pocket Colorimeter**
3. Does plant appear to have sufficient equipment to perform required tests? [X] Yes [ ] No*
4. Does testing equipment appear to be clean and/or operable? [X] Yes [ ] No*

Comments: **Colorimeter is calibrated every morning prior to sampling. DEQ observed the calibration of the instrument, no problems observed. All DPD packets and specs are within expiration dates.**

(E) FOR INDUSTRIAL FACILITIES WITH TECHNOLOGY BASED LIMITS ONLY

1. Is the production process as described in the permit application? (If no, describe changes in comments)
   [ ] Yes [ ] No [X] NA
2. Do products and production rates correspond as provided in the permit application? (If no, list differences)
   [ ] Yes [ ] No [X] NA
3. Has the State been notified of the changes and their impact on plant effluent? Date:
   [ ] Yes [ ] No* [X] NA

Comments:

None

UNIT PROCESS: Ponds/Lagoons

1. Type:		[ ] Aerated	[X] Un-aerated	[ ] Polishing	
2. No. of cells:		1	In operation:	1	
3. Color:	[X] Green	[ ] Brown	[ ] L. Brown	[ ] Grey	[ ] Other:
4. Odor:	[ ] Septic*	[ ] Earthy	[X] None	[ ] Other:	
5. System operated in:		[ ] Series	[ ] Parallel	[X] NA	
6. If aerated, are lagoon contents mixed adequately?			[ ] Yes	[ ] No*	[X] NA
7. If aerated, is aeration system operating properly?			[ ] Yes	[ ] No*	[X] NA
8. Evidence of following problems:					
a. vegetation in lagoon or dikes			[X] Yes*	[ ] No	
b. rodents burrowing on dikes			[X] Yes*	[ ] No	
c. erosion			[X] Yes*	[ ] No	
d. sludge bars			[ ] Yes*	[X] No	
e. excessive foam			[ ] Yes*	[X] No	
f. floating material			[X] Yes*	[ ] No	
9. Fencing intact:			[X] Yes	[ ] No*	
10. Grass maintained properly:			[X] Yes	[ ] No	
11. Level control valves working properly:			[X] Yes	[ ] No*	
12. Effluent discharge elevation:		[ ] Top	[ ] Middle	[X] Bottom	
13. Freeboard:		>4'			
14. Appearance of effluent:		[ ] Good	[ ] Fair	[ ] Poor	[X] N/A
15. General condition:			[ ] Good	[X] Fair	[ ] Poor
16. Are monitoring wells present?			[ ] Yes	[X] No	
Are wells adequately protected from runoff?			[ ] Yes	[ ] No*	[X] NA
Are caps on and secured?			[ ] Yes	[ ] No*	[X] NA

Comments:

- **Lagoon has a 750,000 gallon capacity and is adjacent to pump station R.**
- **The lagoon can be utilized for flow equalization and excess flow can be diverted back into the collection system within a few days of a high flow event.**
- **The lagoon is full of duckweed and there is vegetation growth coming through the liner in some areas**
- **There are some rips and tears to the upper liner and areas where it has lifted.**
- **There is a borrowing animal hole around the perimeter of the lagoon.**

UNIT PROCESS: Flow Measurement

[X] Influent [ ] Intermediate [ ] Effluent

1. Type measuring device: **Parshall Flume**
2. Present reading: **0.671 MG**
3. Bypass channel: [ ] Yes [X] No
   Metered: [ ] Yes [ ] No [X] N/A
4. Return flows discharged upstream from meter: [ ] Yes [X] No
   Identify:
5. Device operating properly: [X] Yes [ ] No*
6. Date of last calibration: **January 2014**
7. Evidence of following problems:
   a. obstructions [ ] Yes* [X] No
   b. grease [ ] Yes* [X] No
8. General condition: [X] Good [ ] Fair [ ] Poor

Comments:

No Problems Observed

UNIT PROCESS: Activated Sludge Aeration

1. Number of units: **1** In operation: **1**

2. Mode of operation: **Biological Nutrient Removal - 5 Stage Bardenpho Process**

3. Proper flow distribution between units:	[ ] Yes	[ ] No*	[X] NA
4. Foam control operational:	[ ] Yes	[ ] No*	[X] NA
5. Scum control operational:	[ ] Yes	[ ] No*	[X] NA
6. Evidence of following problems:			
a. dead spots	[ ] Yes*	[X] No	
b. excessive foam	[ ] Yes*	[X] No	
c. poor aeration	[ ] Yes*	[X] No	
d. excessive aeration	[ ] Yes*	[X] No	
e. excessive scum	[ ] Yes*	[X] No	
f. aeration equipment malfunction	[ ] Yes*	[X] No	
g. other (identify in comments)	[ ] Yes*	[X] No	

7. Mixed liquor characteristics (as available): **October 2014-Process Control Train A**

MLSS:	**1852 mg/L**
Color:	**Brown**
Odor:	**Earthy**
D.O. Zone #1	**0.0 mg/L (Anaerobic)**
D.O. Zone #2	**0.1 mg/L (Anoxic I)**
D.O. Zone #3	**3.2 mg/L (Aerobic I)**
D.O. Zone #4	**0.1 mg/L (Anoxic II)**
D.O. Zone #5	**1.8 mg/L (Aerobic II)**
Settleability:	**145 ml/L**
MLVSS:	**1,484 mg/L**

8. Return/waste sludge:
   A. Return Rate: **100%** b. Waste Rate: **100,000 GPD** c. Frequency of Wasting: **Daily**

9. Aeration system control: [ ] Time Clock [ ] Manual [X] Continuous [ ] Other (explain)

10. Effluent control devices working properly (oxidation ditches): [ ] Yes [ ] No* [X] NA

11. General condition: [X] Good [Fair [ ] Poor

Comments:

- **The process includes the following 5 stages: Anaerobic, Anoxic I, Aerobic I, Anoxic II, and Aerobic II. RAS is combined with influent in the aerobic zone where phosphorus is reduced and nitrogen is reduced in the**

UNIT PROCESS: Filtration

1. Type of filters:	[ ] Gravity	[X] Pressure	[ ] Intermittent	
2. Number of units:	**4**	In operation:	**3**	
3. Operation of system:	[X] Automatic	[ ] Semi-automatic	[ ] Manual	[ ] Other(specify)
4. Proper flow distribution between units:		[X] Yes	[ ] No*	[ ] NA
5. Evidence of following problems:				
a. uneven flow distribution		[ ] Yes*	[X] No	
b. filter clogging (ponding)		[ ] Yes*	[X] No	
c. nozzles clogging		[ ] Yes*	[X] No	
d. icing		[ ] Yes*	[X] No	
e. filter flies		[ ] Yes*	[X] No	
f. vegetation on filter		[ ] Yes*	[X] No	
6. Filter aid system provided:		[X] Yes	[ ] No	
Properly operating:		[X] Yes	[ ] No	[ ] NA
Chemical used:		**Alum**		
7. Automatic valves properly operating:		[X] Yes*	[ ] No*	[ ] NA
8. Valves sequencing correctly:		[X] Yes*	[ ] No*	[ ] NA
9. Backwash system operating properly:		[X] Yes*	[ ] No*	[ ] NA
10. Filter building adequately ventilated:		[X] Yes*	[ ] No*	[ ] NA
11. Effluent characteristics:	**Did not see filter effluent-units, they were covered**			
12. General condition:		[X] Good	[ ] Fair	[ ] Poor

Comments:

- **The tertiary filtration system is a continuous backwash system, where effluent enters the bottom of the filter and up-flows through the sand. In this way, the solids are scoured, separated, and carried with backwash water for disposal at the drain pump station.**
- **Spare parts are kept onsite**
- **No problems observed**

UNIT PROCESS: Aerobic Digestion

1. Number of units: **1**	In operation:	**1**		
2. Type of sludge treated		[ ] Primary	[**X**] WAS	[ ] Other
3. Frequency of sludge application to digestors:	**Daily**			
4. Supernatant return rate:	**Unknown**			
5. pH adjustment provided:		[ ] Yes	[**X**] No	
Utilized:		[ ] Yes	[ ] No	[ ] NA
6. Tank contents well-mixed and relatively free of odors:		[**X**] Yes	[ ] No*	
7. If diffused aeration is used, do diffusers require frequent cleaning?		[ ] Yes	[ ] No	[**X**] NA
8. Location of supernatant return:		[ ] Head	[ ] Primary	[**X**] Other
9. Process control testing:				
a. reduction of volatile solids		[**X**] Yes	[ ] No	**5 %**
b. pH		[**X**] Yes	[ ] No	**7.4 s.u.**
c. alkalinity		[ ] Yes	[**X**] No	
d. dissolved oxygen		[**X**] Yes	[ ] No	**1.8 mg/L**
10. Foaming problem present:		[ ] Yes*	[**X**] No	
11. Signs of short-circuiting or overloads:		[ ] Yes*	[**X**] No	
12. General condition:		[**X**] Good	[ ] Fair	[ ] Poor

Comments:

- **Supernatant is returned to the drain pump station onsite**
- **No problems observed**

UNIT PROCESS: Dechlorination

1. Chemical used:	[ ] Sulfur Dioxide		[X] Bisulfite	[ ] Other
2. No. of sulfonators: **1**		In operation:	**1**	
3. No. of evaporators:		In operation:		
4. No. of chemical feeders:		In operation:		
5. No. of contact tanks: **1**		In operation:	**1**	
6. Proper flow distribution between units:		[ ] Yes	[ ] No*	[X] NA

7. How is chemical introduced into the wastewater? **The sodium bisulfate is transferred from drums stored in the chlorination building to the Chlorine Contact Tank effluent via pump system.**

[ ] Perforated diffusers
[X] Injector with single entry point?
[ ] Other

8. Control system operational:	[X] Yes	[ ] No*	
a. residual analyzers:	[ ] Yes	[X] No*	
b. system adjusted:	[X] Automatic	[ ] Manual	[ ] Other:
9. Applied dechlorination dose:	**~60-70 lbs/day, varies based on flow**		
10. Chlorine residual in basin effluent: **0.00 mg/L10/28/14 6:00 am by RSA**			
11. Contact basins adequately baffled:	[X] Yes	[ ] No*	[ ] NA
12. Adequate ventilation:			
a. cylinder storage area:	[X] Yes	[ ] No*	
b. equipment room:	[X] Yes	[ ] No*	
13. Proper safety precautions used:	[X] Yes	[ ] No*	
14. General condition:	[X] Good	[ ] Fair	[ ] Poor

Comments:

- **No problems observed**

UNIT PROCESS: Post Aeration

1. Number of units: **1**		In operation:	**1**		
2. Proper flow distribution between units:		[ ] Yes	[ ] No*	[**X**] NA	
3. Evidence of following problems:					
a. dead spots		[ ] Yes*	[**X**] No		
b. excessive foam		[ ] Yes*	[**X**] No		
c. poor aeration		[ ] Yes*	[**X**] No		
d. mechanical equipment failure		[ ] Yes*	[**X**] No	[ ] NA	
4. How is the aerator controlled?	[ ] Time clock	[ ] Manual	[**X**] Continuous	[ ] Other:	[ ] NA
5. What is the current operating schedule? **Continuous**					
6. Step weirs level:		[**X**] Yes	[ ] No	[ ] NA	
7. Effluent D.O. level:	**9.0 mg/L**				
8. General condition:		[**X**] Good	[ ] Fair	[ ] Poor	

Comments:

- **No problems observed**

UNIT PROCESS: Sludge Pumping

1. Number of Pumps: **2** In operation: **2**

2. Type of sludge pumped: [ ] Primary [ ] Secondary [ ] Return Activated
   [ ] Combination [X] Other: **Digested Sludge Pump**

3. Type of pump: [ ] Plunger [ ] Diaphragm [ ] Screwlift [ ] Centrifugal
   [X] Progressing Cavity [ ] Other:

4. Mode of operation: [ ] Manual [X] Automatic [ ] Other(explain):

5. Sludge volume pumped: **10,000-11,000 gal/day**

6. Alarm system for equipment failures or overloads operational: [X] Yes [ ] No [ ] NA

7. General condition: [X] Good [ ] Fair [ ] Poor

Comments:

- **No problems observed**

Photo 7: Chemical residue on ground

Photo 8: Pipes/tools on ground

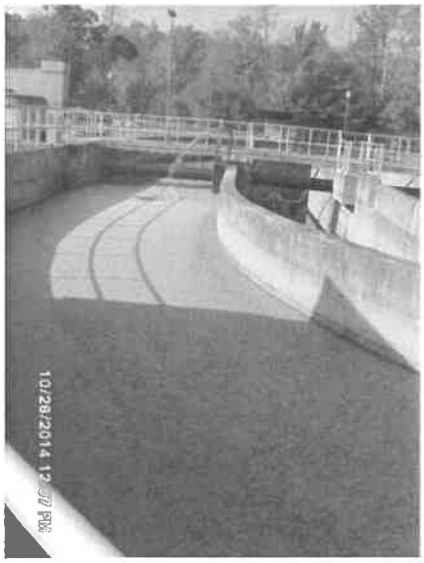


Photo 9: Old oxidation ditch-now equalization basin

Solids on grate

Photo 10: Filter Press

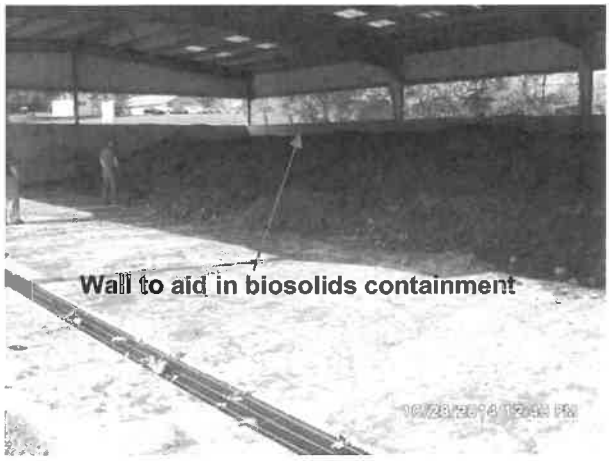


Photo 11: Biosolids Storage-good containment

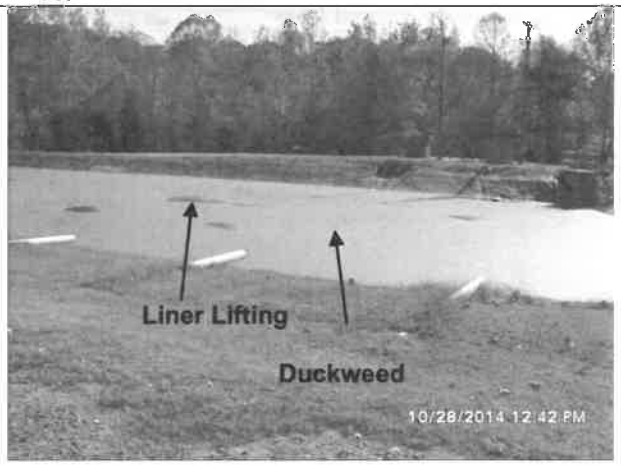


Photo 12: EQ Lagoon

Photos By: Amy Dooley

Layout by: Lisa Janovsky

Permit # VA0083411

Date: October 28, 2014

Attachment 5

To:	Alison Thompson
From:	Rebecca Shoemaker
Date:	March 10, 2016
Subject:	Planning Statement for Wilderness POTW
Permit Number:	VA0083411

Information for Outfall 001:

Discharge Type:	Municipal
Discharge Flow:	2.0 MGD
Receiving Stream:	Rapidan River
Latitude / Longitude:	38 22 30, 77 44 45
Rivermile:	10.47
Streamcode:	3-RAP
Waterbody:	VAN-E18R; RA42
Water Quality Standards:	Class III, Section 4, no special standards
Drainage Area:	640 square miles

1. Please provide water quality monitoring information for the receiving stream segment. If there is not monitoring information for the receiving stream segment, please provide information on the nearest downstream monitoring station, including how far downstream the monitoring station is from the outfall.

This facility discharges to a segment of the Rapidan River that has been neither monitored nor assessed. The nearest DEQ ambient monitoring station is 3-RAP006.53, located at Route 610, approximately 3.9 miles downstream from Outfall 001. The following is the water quality summary for this segment of Rapidan River, as taken from the draft 2014 Integrated Report:

Class III, Section 4.

DEQ monitoring stations located in this segment of Rapidan River:

- *ambient, biological, and fish tissue monitoring station 3-RAP006.53, at Route 610*

This assessment unit was noted with an observed effect for total phosphorus for the 2006 Integrated Assessment. While nutrients will not be assessed until nutrient standards are adopted for free-flowing streams, the observed effect will remain due to the previous assessment. For the 2006 assessment window, four of 30 samples (13.3%) exceeded the total phosphorus screening value of 0.20 mg/L.

E. coli monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. A bacteria TMDL for the Rapidan River watershed has been completed and approved. The fish consumption use is impaired for mercury in fish tissue. The aquatic life use is considered fully supporting, but noted for observed effect for total phosphorus. There is insufficient information to determine the wildlife use.

2. Does this facility discharge to a stream segment on the 303(d) list? If yes, please fill out Table A.

No.

3. Are there any 303(d) listed impairments within 15 miles downstream that are relevant to this discharge? If yes, please fill out Table B.

Table B. Information on Downstream 303(d) Impairments and TMDLs

Waterbody Name	Impaired Use	Cause	Distance From Outfall	TMDL completed	WLA	Basis for WLA	TMDL Schedule
Impairment Information in the Draft 2014 Integrated Report							
Rapidan River	Fish Consumption	Mercury	0.9 mile	No	---	---	2022
	Recreation	*E. coli*	2.8 miles	Rapidan River Basin Bacteria 12/05/2007	3.48E+12 cfu/year *E. coli*	126 cfu/100 ml *E. coli* --- 2.00 MGD	---

4. Is there monitoring or other conditions that Planning/Assessment needs in the permit?

There is a completed downstream TMDL for the aquatic life use impairment for the Chesapeake Bay. However, the Bay TMDL and the WLAs contained within the TMDL are not addressed in this planning statement.

The tidal Rappahannock River, which is located approximately 24 miles downstream from this facility, is listed with a PCB impairment. In support for the PCB TMDL that is scheduled for development by 2016 for the tidal Rappahannock River, this facility is a candidate for low-level PCB monitoring, based upon its designation as a municipal discharger. Low-level PCB analysis uses EPA Method 1668, which is capable of detecting low-level concentrations for all 209 PCB congeners. DEQ staff has concluded that low-level PCB monitoring is not warranted for this facility, as there are no stream segments immediately downstream from this facility that are listed with a PCB impairment. Fish tissue monitoring has been conducted on the Rapidan River and there were no exceedances of the fish tissue criterion for PCBs. Based on this information, this facility will not be requested to monitor for low-level PCBs.

5. Fact Sheet Requirements – Please provide information regarding any drinking water intakes located within a 5 mile radius of the discharge point.

There is one drinking water intake for the Wilderness WTP located within a five mile radius of Outfall 001.

Attachment 6

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Wilderness WWTP Permit No.: VA0083411

Receiving Stream: Rapidan River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO3) =	27.1 mg/L	1Q10 (Annual) =	7.6 MGD	Annual - 1Q10 Mix =	1.67 %	Mean Hardness (as CaCO3) =	208.75 mg/L
90% Temperature (Annual) =	25.3 deg C	7Q10 (Annual) =	12 MGD	- 7Q10 Mix =	100 %	90% Temp (Annual) =	25 deg C
90% Temperature (Wet season) =	15.7 deg C	30Q10 (Annual) =	21.7 MGD	- 30Q10 Mix =	100 %	90% Temp (Wet season) =	15 deg C
90% Maximum pH =	8 SU	1Q10 (Wet season) =	55.7 MGD	Wet Season - 1Q10 Mix =	8.41 %	90% Maximum pH =	7.9 SU
10% Maximum pH =	6.8 SU	30Q10 (Wet season)	102.3 MGD	- 30Q10 Mix =	100 %	10% Maximum pH =	7.4 SU
Tier Designation (1 or 2) =	2	30Q5 =	36.6 MGD			Discharge Flow =	2 MGD
Public Water Supply (PWS) Y/N? =	n	Harmonic Mean =	139 MGD				
Trout Present Y/N? =	n						
Early Life Stages Present Y/N? =	y						

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	9.9E+02	--	--	na	1.9E+04	--	--	na	9.9E+01	--	--	na	1.9E+03	--	--	na	**1.9E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	1.8E+02	--	--	na	9.3E-01	--	--	na	1.8E+01	--	--	na	**1.8E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	1.8E+02	--	--	na	2.5E-01	--	--	na	1.8E+01	--	--	na	**1.8E+01**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.2E+00	--	na	3.5E-02	7.5E-01	--	na	5.0E-05	3.6E+00	--	na	3.5E-03	**3.2E+00**	--	na	**3.5E-03**
Ammonia-N (mg/l) (Yearly)	0	1.00E+01	1.23E+00	na	--	1.07E+01	1.46E+01	na	--	2.19E+00	3.08E-01	na	--	1.05E+01	3.65E+00	na	--	**1.05E+01**	**3.65E+00**	na	--
Ammonia-N (mg/l) (High Flow)	0	8.94E+00	2.26E+00	na	--	2.99E+01	1.18E+02	na	--	2.12E+00	5.66E-01	na	--	6.11E+01	2.95E+01	na	--	**2.99E+01**	**2.95E+01**	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	7.7E+05	--	--	na	4.0E+03	--	--	na	7.7E+04	--	--	na	**7.7E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	1.2E+04	--	--	na	6.4E+01	--	--	na	1.2E+03	--	--	na	**1.2E+03**
Arsenic	0	3.4E+02	1.5E+02	na	--	3.6E+02	1.1E+03	na	--	8.5E+01	3.8E+01	na	--	4.1E+02	2.6E+02	na	--	**3.6E+02**	**2.6E+02**	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	3.6E+04	--	--	na	5.1E+01	--	--	na	3.6E+03	--	--	na	**3.6E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	1.4E-01	--	--	na	2.0E-04	--	--	na	1.4E-02	--	--	na	**1.4E-02**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	**1.3E+00**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	3.7E+02	--	--	na	5.3E-01	--	--	na	3.7E+01	--	--	na	**3.7E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	1.3E+06	--	--	na	6.5E+03	--	--	na	1.3E+05	--	--	na	**1.3E+05**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	1.6E+03	--	--	na	2.2E+00	--	--	na	1.6E+02	--	--	na	**1.6E+02**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	9.9E+04	--	--	na	1.4E+02	--	--	na	9.9E+03	--	--	na	**9.9E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	3.7E+04	--	--	na	1.9E+02	--	--	na	3.7E+03	--	--	na	**3.7E+03**
Cadmium	0	8.5E+00	6.9E-01	na	--	9.0E+00	4.8E+00	na	--	6.0E-01	1.7E-01	na	--	2.9E+00	1.2E+00	na	--	**2.9E+00**	**1.2E+00**	na	--
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	1.1E+03	--	--	na	1.6E+00	--	--	na	1.1E+02	--	--	na	**1.1E+02**
Chlordane[C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.6E+00	3.0E-02	na	5.7E-01	6.0E-01	1.1E-03	na	8.1E-04	2.9E+00	7.5E-03	na	5.7E-02	**2.6E+00**	**7.5E-03**	na	**5.7E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	9.1E+05	1.6E+06	na	--	2.2E+05	5.8E+04	na	--	1.0E+06	4.0E+05	na	--	**9.1E+05**	**4.0E+05**	na	--
TRC	0	1.9E+01	1.1E+01	na	--	2.0E+01	7.7E+01	na	--	4.8E+00	2.8E+00	na	--	2.3E+01	1.9E+01	na	--	**2.0E+01**	**1.9E+01**	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	3.1E+04	--	--	na	1.6E+02	--	--	na	3.1E+03	--	--	na	**3.1E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	9.2E+03	--	--	na	1.3E+01	--	--	na	9.2E+02	--	--	na	9.2E+02
Chloroform	0	--	--	na	1.1E+04	--	--	na	2.1E+05	--	--	na	1.1E+03	--	--	na	2.1E+04	--	--	na	2.1E+04
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	3.1E+04	--	--	na	1.6E+02	--	--	na	3.1E+03	--	--	na	3.1E+03
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	2.9E+03	--	--	na	1.5E+01	--	--	na	2.9E+02	--	--	na	2.9E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.8E-02	2.9E-01	na	--	2.1E-02	1.0E-02	na	--	1.0E-01	7.2E-02	na	--	8.8E-02	7.2E-02	na	--
Chromium III	0	1.0E+03	4.4E+01	na	--	1.1E+03	3.1E+02	na	--	1.0E+02	1.1E+01	na	--	4.8E+02	7.7E+01	na	--	4.8E+02	7.7E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.7E+01	7.7E+01	na	--	4.0E+00	2.8E+00	na	--	1.9E+01	1.9E+01	na	--	1.7E+01	1.9E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	1.9E+02	--	--	--	na	--
Chrysene[C]	0	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.8E-03	--	--	na	1.3E-01	--	--	na	1.3E-01
Copper	0	2.6E+01	5.2E+00	na	--	2.7E+01	3.6E+01	na	--	2.2E+00	1.3E+00	na	--	1.1E+01	9.1E+00	na	--	1.1E+01	9.1E+00	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.3E+01	3.6E+01	na	3.1E+05	5.5E+00	1.3E+00	na	1.6E+03	2.6E+01	9.1E+00	na	3.1E+04	2.3E+01	9.1E+00	na	3.1E+04
DDD[C]	0	--	--	na	3.1E-03	--	--	na	2.2E-01	--	--	na	3.1E-04	--	--	na	2.2E-02	--	--	na	2.2E-02
DDE[C]	0	--	--	na	2.2E-03	--	--	na	1.6E-01	--	--	na	2.2E-04	--	--	na	1.6E-02	--	--	na	1.6E-02
DDT[C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.2E+00	7.0E-03	na	1.6E-01	2.8E-01	2.5E-04	na	2.2E-04	1.3E+00	1.8E-03	na	1.6E-02	1.2E+00	1.8E-03	na	1.6E-02
Demeton	0	--	1.0E-01	na	--	--	7.0E-01	na	--	--	2.5E-02	na	--	--	1.8E-01	na	--	--	1.8E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	1.8E-01	1.2E+00	na	--	4.3E-02	4.3E-02	na	--	2.0E-01	3.0E-01	na	--	1.8E-01	3.0E-01	na	--
Dibenz(a,h)anthracene[C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.3E+00
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	2.5E+04	--	--	na	1.3E+02	--	--	na	2.5E+03	--	--	na	2.5E+03
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	1.9E+04	--	--	na	9.6E+01	--	--	na	1.9E+03	--	--	na	1.9E+03
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	3.7E+03	--	--	na	1.9E+01	--	--	na	3.7E+02	--	--	na	3.7E+02
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	2.0E+01	--	--	na	2.8E-02	--	--	na	2.0E+00	--	--	na	2.0E+00
Dichlorobromomethane[C]	0	--	--	na	1.7E+02	--	--	na	1.2E+04	--	--	na	1.7E+01	--	--	na	1.2E+03	--	--	na	1.2E+03
1,2-Dichloroethane[C]	0	--	--	na	3.7E+02	--	--	na	2.6E+04	--	--	na	3.7E+01	--	--	na	2.6E+03	--	--	na	2.6E+03
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	1.4E+05	--	--	na	7.1E+02	--	--	na	1.4E+04	--	--	na	1.4E+04
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.9E+05	--	--	na	1.0E+03	--	--	na	1.9E+04	--	--	na	1.9E+04
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	5.6E+03	--	--	na	2.9E+01	--	--	na	5.6E+02	--	--	na	5.6E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	1.1E+04	--	--	na	1.5E+01	--	--	na	1.1E+03	--	--	na	1.1E+03
1,3-Dichloropropene[C]	0	--	--	na	2.1E+02	--	--	na	1.5E+04	--	--	na	2.1E+01	--	--	na	1.5E+03	--	--	na	1.5E+03
Dieldrin[C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.6E-01	3.9E-01	na	3.8E-02	6.0E-02	1.4E-02	na	5.4E-05	2.9E-01	9.8E-02	na	3.8E-03	2.6E-01	9.8E-02	na	3.8E-03
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	8.5E+05	--	--	na	4.4E+03	--	--	na	8.5E+04	--	--	na	8.5E+04
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	1.6E+04	--	--	na	8.5E+01	--	--	na	1.6E+03	--	--	na	1.6E+03
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	2.1E+07	--	--	na	1.1E+05	--	--	na	2.1E+06	--	--	na	2.1E+06
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	8.7E+04	--	--	na	4.5E+02	--	--	na	8.7E+03	--	--	na	8.7E+03
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	1.0E+05	--	--	na	5.3E+02	--	--	na	1.0E+04	--	--	na	1.0E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	5.4E+03	--	--	na	2.8E+01	--	--	na	5.4E+02	--	--	na	5.4E+02
2,4-Dinitrotoluene[C]	0	--	--	na	3.4E+01	--	--	na	2.4E+03	--	--	na	3.4E+00	--	--	na	2.4E+02	--	--	na	2.4E+02
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	9.8E-07	--	--	na	5.1E-09	--	--	na	9.8E-08	--	--	na	9.8E-08
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	1.4E+02	--	--	na	2.0E-01	--	--	na	1.4E+01	--	--	na	1.4E+01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.3E-01	3.9E-01	na	1.7E+03	5.5E-02	1.4E-02	na	8.9E+00	2.6E-01	9.8E-02	na	1.7E+02	2.3E-01	9.8E-02	na	1.7E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.3E-01	3.9E-01	na	1.7E+03	5.5E-02	1.4E-02	na	8.9E+00	2.6E-01	9.8E-02	na	1.7E+02	2.3E-01	9.8E-02	na	1.7E+02
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.3E-01	3.9E-01	--	--	5.5E-02	1.4E-02	--	--	2.6E-01	9.8E-02	--	--	2.3E-01	9.8E-02	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	1.7E+03	--	--	na	8.9E+00	--	--	na	1.7E+02	--	--	na	1.7E+02
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	9.1E-02	2.5E-01	na	1.2E+00	2.2E-02	9.0E-03	na	6.0E-03	1.0E-01	6.3E-02	na	1.2E-01	9.1E-02	6.3E-02	na	1.2E-01
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	5.8E+00	--	--	na	3.0E-02	--	--	na	5.8E-01	--	--	na	5.8E-01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	4.1E+04	--	--	na	2.1E+02	--	--	na	4.1E+03	--	--	na	4.1E+03
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	2.7E+03	--	--	na	1.4E+01	--	--	na	2.7E+02	--	--	na	2.7E+02
Fluorene	0	--	--	na	5.3E+03	--	--	na	1.0E+05	--	--	na	5.3E+02	--	--	na	1.0E+04	--	--	na	1.0E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	7.0E-02	na	--	--	2.5E-03	na	--	--	1.8E-02	na	--	--	1.8E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.5E-01	2.7E-02	na	5.6E-02	1.3E-01	9.5E-04	na	7.9E-05	6.2E-01	6.7E-03	na	5.6E-03	5.5E-01	6.7E-03	na	5.6E-03
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.5E-01	2.7E-02	na	2.7E-02	1.3E-01	9.5E-04	na	3.9E-05	6.2E-01	6.7E-03	na	2.7E-03	5.5E-01	6.7E-03	na	2.7E-03
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	2.0E-01	--	--	na	2.9E-04	--	--	na	2.0E-02	--	--	na	2.0E-02
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	1.3E+04	--	--	na	1.8E+01	--	--	na	1.3E+03	--	--	na	1.3E+03
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	3.5E+00	--	--	na	4.9E-03	--	--	na	3.5E-01	--	--	na	3.5E-01
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	1.2E+01	--	--	na	1.7E-02	--	--	na	1.2E+00	--	--	na	1.2E+00
Hexachlorocyclohexane Gamma-BHC[C](Lindane)	0	9.5E-01	na	na	1.8E+00	1.0E+00	--	na	1.3E+02	2.4E-01	--	na	1.8E-01	1.1E+00	--	na	1.3E+01	1.0E+00	--	na	1.3E+01
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	2.1E+04	--	--	na	1.1E+02	--	--	na	2.1E+03	--	--	na	2.1E+03
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	2.3E+03	--	--	na	3.3E+00	--	--	na	2.3E+02	--	--	na	2.3E+02
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.4E+01	na	--	--	5.0E-01	na	--	--	3.5E+00	na	--	--	3.5E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.3E+01	--	--	na	1.8E-02	--	--	na	1.3E+00	--	--	na	1.3E+00
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	6.8E+05	--	--	na	9.6E+02	--	--	na	6.8E+04	--	--	na	6.8E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Lead	0	2.8E+02	6.0E+00	na	--	3.0E+02	4.2E+01	na	--	1.7E+01	1.5E+00	na	--	8.2E+01	1.1E+01	na	--	8.2E+01	1.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	7.0E-01	na	--	--	2.5E-02	na	--	--	1.8E-01	na	--	--	1.8E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	1.5E+00	5.4E+00	--	--	3.5E-01	1.9E-01	--	--	1.7E+00	1.3E+00	--	--	1.5E+00	1.3E+00	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	2.9E+04	--	--	na	1.5E+02	--	--	na	2.9E+03	--	--	na	2.9E+03
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	4.2E+05	--	--	na	5.9E+02	--	--	na	4.2E+04	--	--	na	4.2E+04
Methoxychlor	0	--	3.0E-02	na	--	--	2.1E-01	na	--	--	7.5E-03	na	--	--	5.3E-02	na	--	--	5.3E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Nickel	0	3.2E+02	1.2E+01	na	4.6E+03	3.5E+02	8.3E+01	na	8.9E+04	3.2E+01	3.0E+00	na	4.6E+02	1.5E+02	2.1E+01	na	8.9E+03	1.5E+02	2.1E+01	na	8.9E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	1.3E+04	--	--	na	6.9E+01	--	--	na	1.3E+03	--	--	na	1.3E+03
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	2.1E+03	--	--	na	3.0E+00	--	--	na	2.1E+02	--	--	na	2.1E+02
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	4.2E+03	--	--	na	6.0E+00	--	--	na	4.2E+02	--	--	na	4.2E+02
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	3.6E+02	--	--	na	5.1E-01	--	--	na	3.6E+01	--	--	na	3.6E+01
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.0E+01	4.6E+01	na	--	7.0E+00	1.7E+00	--	--	3.4E+01	1.2E+01	--	--	3.0E+01	1.2E+01	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	6.9E-02	9.1E-02	na	--	1.6E-02	3.3E-03	na	--	7.8E-02	2.3E-02	na	--	6.9E-02	2.3E-02	na	--
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	9.8E-02	na	4.5E-02	--	3.5E-03	na	6.4E-05	--	2.5E-02	na	4.5E-03	--	2.5E-02	na	4.5E-03
Pentachlorophenol [C]	0	1.2E+01	5.8E+00	na	3.0E+01	1.3E+01	4.0E+01	na	2.1E+03	1.9E+00	1.4E+00	na	3.0E+00	9.2E+00	1.0E+01	na	2.1E+02	9.2E+00	1.0E+01	na	2.1E+02
Phenol	0	--	--	na	8.6E+05	--	--	na	1.7E+07	--	--	na	8.6E+04	--	--	na	1.7E+06	--	--	na	1.7E+06
Pyrene	0	--	--	na	4.0E+03	--	--	na	7.7E+04	--	--	na	4.0E+02	--	--	na	7.7E+03	--	--	na	7.7E+03
Radionudides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
(mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.1E+01	3.5E+01	na	8.1E+04	5.0E+00	1.3E+00	na	4.2E+02	2.4E+01	8.8E+00	na	8.1E+03	**2.1E+01**	**8.8E+00**	**na**	**8.1E+03**
Silver	0	1.1E+01	--	na	--	1.2E+01	--	na	--	4.1E-01	--	na	--	2.0E+00	--	na	--	**2.0E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	2.8E+03	--	--	na	4.0E+00	--	--	na	2.8E+02	**--**	**--**	**na**	**2.8E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	2.3E+03	--	--	na	3.3E+00	--	--	na	2.3E+02	**--**	**--**	**na**	**2.3E+02**
Thallium	0	--	--	na	4.7E-01	--	--	na	9.1E+00	--	--	na	4.7E-02	--	--	na	9.1E-01	**--**	**--**	**na**	**9.1E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	1.2E+05	--	--	na	6.0E+02	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	7.8E-01	1.4E-03	na	2.0E-01	1.8E-01	5.0E-05	na	2.8E-04	8.8E-01	3.5E-04	na	2.0E-02	**7.8E-01**	**3.5E-04**	**na**	**2.0E-02**
Tributyltin	0	4.6E-01	7.2E-02	na	--	4.9E-01	5.0E-01	na	--	1.2E-01	1.8E-02	na	--	5.5E-01	1.3E-01	na	--	**4.9E-01**	**1.3E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	1.4E+03	--	--	na	7.0E+00	--	--	na	1.4E+02	**--**	**--**	**na**	**1.4E+02**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	1.1E+04	--	--	na	1.6E+01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	2.1E+04	--	--	na	3.0E+01	--	--	na	2.1E+03	**--**	**--**	**na**	**2.1E+03**
2,4,6-Trichlorophenol[C]	0	--	--	na	2.4E+01	--	--	na	1.7E+03	--	--	na	2.4E+00	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	1.7E+03	--	--	na	2.4E+00	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
Zinc	0	2.1E+02	6.9E+01	na	2.6E+04	2.2E+02	4.8E+02	na	5.0E+05	2.0E+01	1.7E+01	na	2.6E+03	9.8E+01	1.2E+02	na	5.0E+04	**9.8E+01**	**1.2E+02**	**na**	**5.0E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information. Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	1.2E+03
Arsenic	1.4E+02
Barium	na
Cadmium	7.2E-01
Chromium III	4.6E+01
Chromium VI	6.8E+00
Copper	4.3E+00
Iron	na
Lead	6.3E+00
Manganese	na
Mercury	6.0E-01
Nickel	1.2E+01
Selenium	5.3E+00
Silver	7.9E-01
Zinc	3.9E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = 2.0 MGD
Stream 7Q10 = 12 MGD
Stream 30Q10 = 21.7 MGD
Stream 1Q10 = 7.6 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .3347 ft
Length = 49696.21 ft
Velocity = .3238 ft/sec
Residence Time = 1.7766 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .4592 ft
Length = 38148.15 ft
Velocity = .3994 ft/sec
Residence Time = 1.1054 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .2668 ft
Length = 60053.98 ft
Velocity = .2785 ft/sec
Residence Time = 59.9026 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 1.67% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

Mixing Zone Predictions for Wilderness WWTP

Effluent Flow = 2 MGD
Stream 7Q10 = 76 MGD
Stream 30Q10 = 102.3 MGD
Stream 1Q10 = 55.7 MGD
Stream slope = .004 ft/ft
Stream width = 200 ft
Bottom scale = 4
Channel scale = 2

Mixing Zone Predictions @ 7Q10

Depth = .9403 ft
Length = 20927.76 ft
Velocity = .642 ft/sec
Residence Time = .3773 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = 1.1202 ft
Length = 18065.68 ft
Velocity = .7207 ft/sec
Residence Time = .2901 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .7842 ft
Length = 24370.09 ft
Velocity = .5695 ft/sec
Residence Time = 11.8876 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 8.41% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

Attachment 7

WILDERNESS WWTP PH DATA

2015

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1	7.8	7.7	7.5	7.7	7.7	7.9	7.9	7.7	7.5	8.0	6.7	7.6
2	7.8	7.5	7.5	7.6	7.8	7.8	8.0	7.6	7.9	7.8	7.7	7.4
3	7.6	7.7	7.5	7.7	7.8	7.9	8.0	7.6	7.8	7.9	7.6	7.6
4	7.6	7.7	7.7	7.3	7.8	7.9	7.8	7.7	7.7	7.2	7.8	7.5
5	7.7	7.6	7.5	7.6	7.6	7.9	8.0	8.0	7.8	7.8	7.7	7.5
6	7.8	7.6	7.4	7.7	7.9	7.9	7.7	7.6	7.6	7.6	7.5	7.5
7	7.8	7.7	7.4	7.5	8.4	7.6	7.8	7.7	7.8	7.7	7.6	7.5
8	7.8	7.7	7.2	7.5	7.9	7.7	7.9	8.0	7.7	7.5	7.7	7.5
9	7.6	7.6	7.3	7.7	7.8	7.7	7.9	7.8	7.7	7.5	7.6	7.5
10	7.7	7.7	7.3	7.7	7.8	7.7	7.8	7.7	7.9	7.8	7.4	7.7
11	7.7	7.8	7.5	7.5	7.9	7.7	7.6	7.8	7.8	7.7	7.6	7.6
12	7.6	7.7	7.5	7.7	7.9	7.8	7.6	8.0	8.1	7.7	7.8	7.4
13	7.6	7.7	7.4	7.8	7.9	7.9	7.6	7.6	8.2	7.8	7.5	7.4
14	7.7	7.7	7.5	7.8	7.8	8.0	7.7	7.7	7.9	7.9	7.6	8.0
15	7.4	7.7	7.5	7.8	7.8	7.8	7.8	7.6	7.8	8.0	7.6	7.6
16	7.7	7.5	7.4	7.6	7.9	7.8	7.8	7.4	7.9	7.8	7.6	7.6
17	7.7	7.6	7.6	7.7	7.8	7.9	7.8	7.4	7.8	8.0	7.7	7.5
18	7.6	7.8	8.2	7.6	7.8	8.1	7.8	7.5	7.9	7.6	7.6	7.5
19	7.5	7.7	7.6	7.7	7.8	7.9	7.5	7.6	7.9	7.7	7.6	7.7
20	7.6	7.8	7.5	7.7	7.7	8.1	7.9	7.8	7.9	7.6	7.5	7.5
21	7.6	7.7	7.5	7.6	8.1	8.1	8.0	8.0	7.9	7.6	7.6	7.5
22	7.6	7.5	7.6	7.5	7.7	7.8	7.9	7.9	7.7	7.6	7.5	7.6
23	7.4	7.3	7.7	7.6	7.7	8.1	7.8	8.0	7.7	7.6	7.4	7.6
24	7.6	7.7	7.8	7.8	7.8	8.2	7.9	7.6	7.7	7.8	7.4	7.7
25	7.6	7.5	7.7	7.8	7.8	8.1	7.8	7.6	7.8	7.6	7.3	7.5
26	7.6	7.6	7.6	7.7	7.9	8.0	7.7	7.7	8.3	7.6	7.5	7.4
27	7.7	7.6	7.7	7.7	7.9	8.1	7.4	7.8	7.9	8.0	7.5	7.6
28	7.7	7.7	7.5	7.7	7.8	7.6	7.7	7.8	7.8	7.7	7.4	7.7
29	7.7		7.6	7.6	7.9	7.6	7.8	7.9	7.9	7.4	7.5	7.4
30	7.6		7.5	7.7	8.0	7.9	7.7	7.1	7.9	7.6	7.6	7.4
31	7.6		7.5		7.8		7.7	7.7		7.8		7.5
AVER	7.6	7.6	7.5	7.7	7.8	7.9	7.8	7.7	7.8	7.7	7.5	7.5
MAX	7.8	7.8	8.2	7.8	8.4	8.2	8.0	8.0	8.3	8.0	7.8	8.0
MIN	7.4	7.3	7.2	7.3	7.6	7.6	7.4	7.1	7.5	7.2	6.7	7.4

WILDERNESS WWTP PH DATA

2016

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1	7.3	7.5	7.3	7.2	7.3							
2	7.5	7.5	7.4	7.3	7.4							
3	7.3	7.4	7.4	7.5	7.3							
4	7.4	7.4	7.3	7.5	7.4							
5	7.3	7.4	7.5	7.6	7.5							
6	7.4	7.2	7.5	7.5	7.7							
7	7.5	7.6	7.4	7.3	7.8							
8	7.3	7.4	7.6	7.4	7.3							
9	7.4	7.5	7.5	7.4	7.4							
10	7.4	7.6	7.4	7.4	7.4							
11	7.3	7.7	7.5	7.3	7.4							
12	7.3	7.8	7.6	7.4	7.6							
13	7.4	7.6	7.4	7.5	7.7							
14	7.2	7.6	7.3	7.4	7.5							
15	7.5	7.5	7.5	7.5	7.6							
16	7.3	7.3	7.5	7.3	7.5							
17	7.5	7.3	7.5	7.5	7.4							
18	7.7	7.4	7.3	7.4	7.5							
19	7.5	7.4	7.4	7.4	7.4							
20	7.5	7.3	7.5	7.5	7.5							
21	7.3	7.2	7.7	7.7	7.3							
22	7.5	7.5	7.6	7.5	7.4							
23	7.4	7.4	7.6	7.3	7.4							
24	7.5	7.6	7.5	7.3	7.4							
25	7.4	7.2	7.6	7.2	7.5							
26	7.3	7.4	7.4	7.3	7.5							
27	7.5	7.3	7.7	7.3	7.4							
28	7.3	7.5	7.5	7.8	7.5							
29	7.5	7.5	7.5	7.4	7.7							
30	7.6		7.2	7.4	7.8							
31	7.6		7.3		7.8							
AVER	7.4	7.4	7.5	7.4	7.5							
MAX	7.7	7.8	7.7	7.8	7.8							
MIN	7.2	7.2	7.2	7.2	7.3							

90^{th} percentile = 7.9 s.u.

10^{th} percentile = 7.4 s.u.

Monitoring Period	Total Hardness (mg/L as CaCO3)
January 2012-June 2012	222
July 2012-December 2012	219
January 2013-June 2013	269
July 2013-December 2013	186
January 2014-June 2014	165
July 2014-December 2014	218
January 2015-June 2015	208
July 2015-December 2015	183
Average Effluent Value	208.75

Attachment 8

2.c

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

File Information

File Name:	I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness S
Date Modified:	April 06, 2006

Water Quality Standards Information

Stream Name:	RAPIDAN RIVER
River Basin:	Rappahannock River Basin
Section:	4
Class:	III - Nontidal Waters (Coastal and Piedmont)
Special Standards:	none

Background Flow Information

Gauge Used:	01667500
Gauge Drainage Area:	472 Sq.Mi.
Gauge 7Q10 Flow:	13.4 MGD
Headwater Drainage Area:	640 Sq.Mi.
Headwater 7Q10 Flow:	16.169 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	-2 MGD
Incremental Flow in Segments:	2.838983E-02 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	22 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	7.845246 mg/l

Model Segmentation

Number of Segments:	4
Model Start Elevation:	175 ft above MSL
Model End Elevation:	120 ft above MSL

2.0

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	WILDERNESS WWTP
VPDES Permit No.:	

Discharger Flow Information

Flow:	2 MGD
cBOD5:	8 mg/l
TKN:	3 mg/l
D.O.:	6.5 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.9 miles
Upstream Drainage Area:	640 Sq.Mi.
Downstream Drainage Area:	662 Sq.Mi.
Upstream Elevation:	175 Ft.
Downstream Elevation:	172 Ft.

Hydraulic Information

Segment Width:	200 Ft.
Segment Depth:	0.833 Ft.
Segment Velocity:	0.183 Ft./Sec.
Segment Flow:	18.169 MGD
Incremental Flow:	0.625 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	1 Ft.
Riffle Depth:	0.5 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 2

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	FLAT RUN

Tributary Flow Information

Flow:	0.6463 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.846 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	5.6 miles
Upstream Drainage Area:	662 Sq.Mi.
Downstream Drainage Area:	685 Sq.Mi.
Upstream Elevation:	172 Ft.
Downstream Elevation:	150 Ft.

Hydraulic Information

Segment Width:	200.001 Ft.
Segment Depth:	0.646 Ft.
Segment Velocity:	0.168 Ft./Sec.
Segment Flow:	18.815 MGD
Incremental Flow:	0.653 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 3

Definition Information

Segment Definition:	A significant change occurs.

Geographic Information

Segment Length:	2.72 miles
Upstream Drainage Area:	685 Sq.Mi.
Downstream Drainage Area:	692 Sq.Mi.
Upstream Elevation:	150 Ft.
Downstream Elevation:	130 Ft.

Hydraulic Information

Segment Width:	150.002 Ft.
Segment Depth:	0.672 Ft.
Segment Velocity:	0.212 Ft./Sec.
Segment Flow:	18.815 MGD
Incremental Flow:	0.199 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Moderately Meandering
Pool and Riffle:	Yes
Percent Pools:	50
Percent Riffles:	50
Pool Depth:	1 Ft.
Riffle Depth:	0.35 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	Few
Algae:	None

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to RAPIDAN RIVER.

Segment Information for Segment 4

Definition Information

Segment Definition:	A tributary enters.
Tributary Name:	UT RAPIDAN RIVER

Tributary Flow Information

Flow:	0.4 MGD
cBOD5:	2 mg/l
TKN:	0 mg/l
D.O.:	7.858 mg/l
Temperature:	22 Degrees C

Geographic Information

Segment Length:	0.53 miles
Upstream Drainage Area:	692 Sq.Mi.
Downstream Drainage Area:	693 Sq.Mi.
Upstream Elevation:	130 Ft.
Downstream Elevation:	120 Ft.

Hydraulic Information

Segment Width:	150.001 Ft.
Segment Depth:	0.52 Ft.
Segment Velocity:	0.272 Ft./Sec.
Segment Flow:	19.215 MGD
Incremental Flow:	0.028 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	No
Bottom Type:	Large Rock
Sludge:	None
Plants:	Light
Algae:	None

"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness STP\2006 Reissuance\Wilderness_2_8_3_65update_flow.mod On 4/6/2006 6:43:37 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"

"7Q10"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
16.169,	2,	0,	7.845,	22

"Discharge/Tributary Input Data for Segment 1"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
2,	8,	3,	,6.5,	22

"Hydraulic Information for Segment 1"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
.9,	200,	.833,	.183

"Initial Mix Values for Segment 1"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
18.169,	7.697,	6.651,	0,	8.717,	22

"Rate Constants for Segment 1. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.329,	2,	2.097,	.15,	.175,	0,	0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"

"Total"	"Segm."			
"Dist."	"Dist."	"DO"	"cBOD"	"nBOD"
"(mi)"	"(mi)"	"(mg/l)"	"(mg/l)"	"(mg/l)"
0,	0,	7.697,	6.651,	0
.1,	.1,	7.696,	6.578,	0
.2,	.2,	7.696,	6.506,	0
.3,	.3,	7.696,	6.435,	0
.4,	.4,	7.697,	6.365,	0
.5,	.5,	7.699,	6.295,	0
.6,	.6,	7.701,	6.226,	0
.7,	.7,	7.704,	6.158,	0
.8,	.8,	7.708,	6.091,	0
.9,	.9,	7.712,	6.024,	0

"Discharge/Tributary Input Data for Segment 2"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.6463,	2,	0,	,7.846,	22

"Incremental Flow Input Data for Segment 2"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.625,	2,	0,	,7.849,	22

"Hydraulic Information for Segment 2"

"Length",	"Width",	"Depth",	"Velocity"
"(mi)",	"(ft)",	"(ft)",	"(ft/sec)"
5.6,	200.001,	.646,	.168

"Initial Mix Values for Segment 2"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
19.4403	7.721	5.957	0	8.721	22

"Rate Constants for Segment 2. - (All units Per Day)"

"k1"	"k1@T"	"k2"	"k2@T"	"kn"	"kn@T"	"BD"	"BD@T"
.5	.548	2.357	2.472	.25	.292	0	0

"Output for Segment 2"
"Segment starts at FLAT RUN"

"Total" "Dist." "(mi)"	"Segm." "Dist." "(mi)"	"DO" "(mg/l)"	"cBOD" "(mg/l)"	"nBOD" "(mg/l)"
.9	0	7.721	5.957	0
1	.1	7.695	5.839	0
1.1	.2	7.673	5.724	0
1.2	.3	7.655	5.611	0
1.3	.4	7.641	5.5	0
1.4	.5	7.63	5.391	0
1.5	.6	7.622	5.285	0
1.6	.7	7.617	5.181	0
1.7	.8	7.614	5.079	0
1.8	.9	7.613	5	0
1.9	1	7.708	5	0
2	1.1	7.795	5	0
2.1	1.2	7.849	5	0
2.2	1.3	7.849	5	0
2.3	1.4	7.849	5	0
2.4	1.5	7.849	5	0
2.5	1.6	7.849	5	0
2.6	1.7	7.849	5	0
2.7	1.8	7.849	5	0
2.8	1.9	7.849	5	0
2.9	2	7.849	5	0
3	2.1	7.849	5	0
3.1	2.2	7.849	5	0
3.2	2.3	7.849	5	0
3.3	2.4	7.849	5	0
3.4	2.5	7.849	5	0
3.5	2.6	7.849	5	0
3.6	2.7	7.849	5	0
3.7	2.8	7.849	5	0
3.8	2.9	7.849	5	0
3.9	3	7.849	5	0
4	3.1	7.849	5	0
4.1	3.2	7.849	5	0
4.2	3.3	7.849	5	0
4.3	3.4	7.849	5	0
4.4	3.5	7.849	5	0
4.5	3.6	7.849	5	0
4.6	3.7	7.849	5	0
4.7	3.8	7.849	5	0
4.8	3.9	7.849	5	0
4.9	4	7.849	5	0
5	4.1	7.849	5	0
5.1	4.2	7.849	5	0
5.2	4.3	7.849	5	0
5.3	4.4	7.849	5	0
5.4	4.5	7.849	5	0
5.5	4.6	7.849	5	0
5.6	4.7	7.849	5	0

5.7,	4.8,	7.849,	5,	0
5.8,	4.9,	7.849,	5,	0
5.9,	5,	7.849,	5,	0
6,	5.1,	7.849,	5,	0
6.1,	5.2,	7.849,	5,	0
6.2,	5.3,	7.849,	5,	0
6.3,	5.4,	7.849,	5,	0
6.4,	5.5,	7.849,	5,	0
6.5,	5.6,	7.849,	5,	0

"Discharge/Tributary Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
0,	0,	0,	,0,	0

"Incremental Flow Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
.653,	2,	0,	,7.855,	22

"Hydraulic Information for Segment 3"

"Length",	"Width",	"Depth",	"Velocity"
"(mi)",	"(ft)",	"(ft)",	"(ft/sec)"
2.72,	150.002,	.672,	.212

"Initial Mix Values for Segment 3"

"Flow",	"DO",	"cBOD",	"nBOD",	"DOSat",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
20.0933,	7.849,	5,	0,	8.728,	22

"Rate Constants for Segment 3. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.329,	4.412,	4.626,	.15,	.175,	0,	0

"Output for Segment 3"
"Segment starts at "

"Total",	"Segm."			
"Dist.",	"Dist.",	"DO",	"cBOD",	"nBOD"
"(mi)",	"(mi)",	"(mg/l)",	"(mg/l)",	"(mg/l)"
6.5,	0,	7.849,	5,	0
6.6,	.1,	7.855,	5,	0
6.7,	.2,	7.855,	5,	0
6.8,	.3,	7.855,	5,	0
6.9,	.4,	7.855,	5,	0
7,	.5,	7.855,	5,	0
7.1,	.6,	7.855,	5,	0
7.2,	.7,	7.855,	5,	0
7.3,	.8,	7.855,	5,	0
7.4,	.9,	7.855,	5,	0
7.5,	1,	7.855,	5,	0
7.6,	1.1,	7.855,	5,	0
7.7,	1.2,	7.855,	5,	0
7.8,	1.3,	7.855,	5,	0
7.9,	1.4,	7.855,	5,	0
8,	1.5,	7.855,	5,	0
8.1,	1.6,	7.855,	5,	0
8.2,	1.7,	7.855,	5,	0
8.3,	1.8,	7.855,	5,	0
8.4,	1.9,	7.855,	5,	0
8.5,	2,	7.855,	5,	0

```
8.6,      2.1,      7.855,    5,          0
8.7,      2.2,      7.855,    5,          0
8.8,      2.3,      7.855,    5,          0
8.9,      2.4,      7.855,    5,          0
9,        2.5,      7.855,    5,          0
9.1,      2.6,      7.855,    5,          0
9.2,      2.7,      7.855,    5,          0
9.22,     2.72,     7.855,    5,          0



"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.4,       2,         0,         ,7.858,    22

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",   "TKN",     "DO",      "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
.199,     2,         0,         ,7.859,    22

"Hydraulic Information for Segment 4"
"Length","Width",   "Depth",   "Velocity"
"(mi)",   "(ft)",    "(ft)",    "(ft/sec)"
.53,      150.001,   .52,       .272

"Initial Mix Values for Segment 4"
"Flow",   "DO",      "cBOD",    "nBOD",    "DOSat",   "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
20.6923, 7.855,     5,         0,         8.732,     22

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",   "k1@T", "k2",    "k2@T", "kn",    "kn@T", "BD",    "BD@T"
.5,     .548,   11.321, 11.871, .25,     .292,   0,       0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total", "Segm."
"Dist.", "Dist.",   "DO",      "cBOD",    "nBOD"
"(mi)",  "(mi)",    "(mg/l)", "(mg/l)", "(mg/l)"
9.22,     0,         7.855,    5,          0
9.32,     .1,        7.859,    5,          0
9.42,     .2,        7.859,    5,          0
9.52,     .3,        7.859,    5,          0
9.62,     .4,        7.859,    5,          0
9.72,     .5,        7.859,    5,          0
9.75,     .53,       7.859,    5,          0


"END OF FILE"
```

"***SEASONAL RUN***"
"Wet Season is from December to May."
"Model Run For I:\althompson\Permit Documents\PERMITS IN PROGRESS\Wilderness STP\2006 Reissuance\Wilderness_2_8_3_65update_flow.mod On 4/6/2006 8:58:30 AM"

"Model is for RAPIDAN RIVER."
"Model starts at the WILDERNESS WWTP discharge."

"Background Data"
"7Q10", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
88.5424, 2, 0, 8.999, 15

"Discharge/Tributary Input Data for Segment 1"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
2, 20, 7, ,6.5, 17

"Hydraulic Information for Segment 1"
"Length","Width", "Depth", "Velocity"
"(mi)", "(ft)", "(ft)", "(ft/sec)"
.9, 200, 2.666138, .2627272

"Initial Mix Values for Segment 1"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
90.5424, 8.944, 5.994, .383, 9.99, 15.04418

"Rate Constants for Segment 1. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.3, .239, 2, 1.778, .15, .102, 0, 0

"Output for Segment 1"
"Segment starts at WILDERNESS WWTP"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
0, 0, 8.944, 5.994, .383
.1, .1, 8.953, 5.961, .382
.2, .2, 8.962, 5.928, .381
.3, .3, 8.971, 5.895, .38
.4, .4, 8.979, 5.862, .379
.5, .5, 8.987, 5.83, .378
.6, .6, 8.991, 5.798, .377
.7, .7, 8.991, 5.766, .376
.8, .8, 8.991, 5.734, .375
.9, .9, 8.991, 5.702, .374

"Discharge/Tributary Input Data for Segment 2"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.5392, 2, 0, ,9.004, 15

"Incremental Flow Input Data for Segment 2"
"Flow", "cBOD5", "TKN", "DO", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
3.422536,2, 0, ,8.996, 15

"Hydraulic Information for Segment 2"
"Length","Width", "Depth", "Velocity"

"(mi)", "(ft)", "(ft)", "(ft/sec)"
5.6, 200.001, .646, .168

"Initial Mix Values for Segment 2"
"Flow", "DO", "cBOD", "nBOD", "DOSat", "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
97.5041, 8.992, 5.652, .347, 9.995, 15.04102

"Rate Constants for Segment 2. - (All units Per Day)"
"k1", "k1@T", "k2", "k2@T", "kn", "kn@T", "BD", "BD@T"
.5, .398, 2.357, 2.096, .25, .171, 0, 0

"Output for Segment 2"
"Segment starts at FLAT RUN"
"Total", "Segm."
"Dist.", "Dist.", "DO", "cBOD", "nBOD"
"(mi)", "(mi)", "(mg/l)", "(mg/l)", "(mg/l)"
.9, 0, 8.992, 5.652, .347
1, .1, 8.985, 5.571, .345
1.1, .2, 8.98, 5.491, .343
1.2, .3, 8.976, 5.412, .341
1.3, .4, 8.974, 5.334, .339
1.4, .5, 8.973, 5.257, .337
1.5, .6, 8.973, 5.181, .335
1.6, .7, 8.974, 5.107, .333
1.7, .8, 8.976, 5.034, .331
1.8, .9, 8.979, 5, .329
1.9, 1, 8.996, 5, .327
2, 1.1, 8.996, 5, .325
2.1, 1.2, 8.996, 5, .323
2.2, 1.3, 8.996, 5, .321
2.3, 1.4, 8.996, 5, .319
2.4, 1.5, 8.996, 5, .317
2.5, 1.6, 8.996, 5, .315
2.6, 1.7, 8.996, 5, .313
2.7, 1.8, 8.996, 5, .311
2.8, 1.9, 8.996, 5, .309
2.9, 2, 8.996, 5, .307
3, 2.1, 8.996, 5, .305
3.1, 2.2, 8.996, 5, .303
3.2, 2.3, 8.996, 5, .301
3.3, 2.4, 8.996, 5, .299
3.4, 2.5, 8.996, 5, .297
3.5, 2.6, 8.996, 5, .295
3.6, 2.7, 8.996, 5, .293
3.7, 2.8, 8.996, 5, .291
3.8, 2.9, 8.996, 5, .289
3.9, 3, 8.996, 5, .287
4, 3.1, 8.996, 5, .285
4.1, 3.2, 8.996, 5, .283
4.2, 3.3, 8.996, 5, .281
4.3, 3.4, 8.996, 5, .279
4.4, 3.5, 8.996, 5, .277
4.5, 3.6, 8.996, 5, .275
4.6, 3.7, 8.996, 5, .273
4.7, 3.8, 8.996, 5, .271
4.8, 3.9, 8.996, 5, .269
4.9, 4, 8.996, 5, .267
5, 4.1, 8.996, 5, .265
5.1, 4.2, 8.996, 5, .263
5.2, 4.3, 8.996, 5, .261
5.3, 4.4, 8.996, 5, .259
5.4, 4.5, 8.996, 5, .257

5.5,	4.6,	8.996,	5,	.255
5.6,	4.7,	8.996,	5,	.253
5.7,	4.8,	8.996,	5,	.251
5.8,	4.9,	8.996,	5,	.249
5.9,	5,	8.996,	5,	.247
6,	5.1,	8.996,	5,	.245
6.1,	5.2,	8.996,	5,	.243
6.2,	5.3,	8.996,	5,	.241
6.3,	5.4,	8.996,	5,	.24
6.4,	5.5,	8.996,	5,	.239
6.5,	5.6,	8.996,	5,	.238

"Discharge/Tributary Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
0,	0,	0,	,0,	0

"Incremental Flow Input Data for Segment 3"

"Flow",	"cBOD5",	"TKN",	"DO",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
3.575865,2,		0,	,9.003,	15

"Hydraulic Information for Segment 3"

"Length",	"Width",	"Depth",	"Velocity"
"(mi)",	"(ft)",	"(ft)",	"(ft/sec)"
2.72,	150.002,	.672,	.212

"Initial Mix Values for Segment 3"

"Flow",	"DO",	"cBOD",	"nBOD",	"DOSat",	"Temp"
"(mgd)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"(mg/l)",	"deg C"
101.0799,	8.996,	5,	.23,	10.003,	15.03957

"Rate Constants for Segment 3. - (All units Per Day)"

"k1",	"k1@T",	"k2",	"k2@T",	"kn",	"kn@T",	"BD",	"BD@T"
.3,	.239,	4.412,	3.922,	.15,	.102,	0,	0

"Output for Segment 3"
"Segment starts at "

"Total",	"Segm."			
"Dist.",	"Dist.",	"DO",	"cBOD",	"nBOD"
"(mi)",	"(mi)",	"(mg/l)",	"(mg/l)",	"(mg/l)"
6.5,	0,	8.996,	5,	.23
6.6,	.1,	9.003,	5,	.229
6.7,	.2,	9.003,	5,	.228
6.8,	.3,	9.003,	5,	.227
6.9,	.4,	9.003,	5,	.226
7,	.5,	9.003,	5,	.225
7.1,	.6,	9.003,	5,	.224
7.2,	.7,	9.003,	5,	.223
7.3,	.8,	9.003,	5,	.222
7.4,	.9,	9.003,	5,	.221
7.5,	1,	9.003,	5,	.22
7.6,	1.1,	9.003,	5,	.219
7.7,	1.2,	9.003,	5,	.218
7.8,	1.3,	9.003,	5,	.217
7.9,	1.4,	9.003,	5,	.216
8,	1.5,	9.003,	5,	.215
8.1,	1.6,	9.003,	5,	.214
8.2,	1.7,	9.003,	5,	.213
8.3,	1.8,	9.003,	5,	.212

```
8.4,      1.9,      9.003,    5,        .211
8.5,      2,        9.003,    5,        .21
8.6,      2.1,      9.003,    5,        .209
8.7,      2.2,      9.003,    5,        .208
8.8,      2.3,      9.003,    5,        .207
8.9,      2.4,      9.003,    5,        .206
9,        2.5,      9.003,    5,        .205
9.1,      2.6,      9.003,    5,        .204
9.2,      2.7,      9.003,    5,        .203
9.22,     2.72,     9.003,    5,        .203


"Discharge/Tributary Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
2.1904,   2,        0,        ,9.015,   15

"Incremental Flow Input Data for Segment 4"
"Flow",   "cBOD5",  "TKN",    "DO",     "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
1.089735,2,         0,        ,9.008,   15

"Hydraulic Information for Segment 4"
"Length","Width",  "Depth",  "Velocity"
"(mi)",  "(ft)",   "(ft)",   "(ft/sec)"
.53,      150.001,  1.664336, 2.032944E-02

"Initial Mix Values for Segment 4"
"Flow",   "DO",     "cBOD",   "nBOD",   "DOSat",  "Temp"
"(mgd)", "(mg/l)", "(mg/l)", "(mg/l)", "(mg/l)", "deg C"
104.3601,9.003,     5,        .197,     10.009,   15.03833

"Rate Constants for Segment 4. - (All units Per Day)"
"k1",  "k1@T", "k2",   "k2@T", "kn",   "kn@T", "BD",   "BD@T"
.5,    .398,   11.321, 10.064, .25,    .171,   0,      0

"Output for Segment 4"
"Segment starts at UT RAPIDAN RIVER"
"Total", "Segm."
"Dist.", "Dist.",  "DO",     "cBOD",   "nBOD"
"(mi)",  "(mi)",   "(mg/l)", "(mg/l)", "(mg/l)"
9.22,     0,        9.003,    5,        .197
9.32,     .1,       9.008,    5,        .187
9.42,     .2,       9.008,    5,        .178
9.52,     .3,       9.008,    5,        .169
9.62,     .4,       9.008,    5,        .161
9.72,     .5,       9.008,    5,        .153
9.75,     .53,      9.008,    5,        .151


"END OF FILE"
```

Attachment 9

8/2/2016 9:03:54 AM

Facility = Wilderness WWTP
Chemical = Ammonia as N (Jun-Nov)
Chronic averaging period = 30
WLAa = 10.5
WLAc = 3.65
Q.L. = .2
# samples/mo. = 20
# samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 7.36449584096953
Average Weekly limit = 4.79987143510729
Average Monthly LImit = 3.79015080556446

The data are:

9

8/2/2016 9:05:39 AM

Facility = Wilderness WWTP
Chemical = Ammonia as N (Dec to May)
Chronic averaging period = 30
WLAa = 29.9
WLAc = 29.5
Q.L. = .2
# samples/mo. = 20
# samples/wk. = 5

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

3/29/2011 10:06:05 AM

Facility = Wilderness WWTP
Chemical = Total Residual Chlorine 2.0 MGD
Chronic averaging period = 4
WLAa = 20
WLAc = 19
Q.L. = 100
# samples/mo. = 120
# samples/wk. = 30

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 20
Average Weekly limit = 10.033308239793
Average Monthly LImit = 9.06565849498694

The data are:

200

VA0083411 Zinc STATS with new THard Jul 2011

7/7/2011 1:01:57 PM

Facility = Wilderness WWTP
Chemical = Total Recoverable Zinc 2.0 MGD
Chronic averaging period = 4
WLAa = 65
WLAc = 86
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 14
Expected Value = 45.1599
Variance = 149.760
C.V. = 0.270984
97th percentile daily values = 71.9160
97th percentile 4 day average = 57.6746
97th percentile 30 day average= 49.3626
< Q.L. = 0
Model used = lognormal

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 65
Average Weekly limit = 65
Average Monthly LImit = 65

The data are:

43
36
46
46
22
53
53
39
41
53
58
58
49
31.6

Zinc STATS

8/2/2016 9:26:18 AM

Facility = Wilderness WWTP
Chemical = Zinc
Chronic averaging period = 4
WLAa = 98
WLAc = 120
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 17
Expected Value = 27.8279
Variance = 104.544
C.V. = 0.367425
97th percentile daily values = 44.2380
97th percentile 4 day average = 38.5401
97th percentile 30 day average= 31.3393
< Q.L. = 2
Model used = delta lognormal

No Limit is required for this material

The data are:

30
39
32
28
25
0
28
47
26
24
0
24
30
30
29
43
28

8/2/2016 9:41:16 AM

Facility = Wilderness WWTP
Chemical = Copper
Chronic averaging period = 4
WLAa = 11
WLAc = 9.1
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 8
Expected Value = .624464
Variance = .140384
C.V. = 0.6
97th percentile daily values = 1.51958
97th percentile 4 day average = 1.03897
97th percentile 30 day average= .753137
< Q.L. = 7
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

1.21
0
0
0
0
0
0
0

Attachment 10

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Northern Regional Office
13901 Crown Court **Woodbridge, VA 22193** **(703) 583-3800**

SUBJECT: TOXICS MANAGEMENT PROGRAM (TMP) DATA REVIEW
Wilderness Wastewater Treatment Plant (VA0083411)
REVIEWER: Douglas Frasier
DATE: 10 November 2015

PREVIOUS REVIEW: 26 August 2014

DATA REVIEWED:

This review covers the second (2^{nd}) annual chronic toxicity tests conducted in August 2015 at Outfall 001.

DISCUSSION:

The results of these toxicity tests are summarized in Table 1.

The chronic toxicity of the effluent samples was determined with a 3-brood static daily renewal survival and reproduction chronic test using *C. dubia* as the test species and a 7-day daily renewal larval survival and growth test using *P. promelas* as the test species.

CONCLUSION:

The chronic toxicity tests are valid and the results are acceptable. The test results indicate that the effluent samples from Outfall 001 exhibit no chronic toxicity to the test species *C. dubia* or *P. promelas*.

BIOMONITORING RESULTS
Wilderness Wastewater Treatment Plant (VA0083411)

Table 1
Summary of Toxicity Test Results for Outfall 001

TEST DATE	TEST TYPE/ORGANISM	48-h LC_{50} (%)	IC_{25} (%)	NOEC (%)	% SURV	TU_c	LAB	REMARKS
03/27/12	Chronic *C. dubia*	>100	>100	100 SR	100	1	CBI	1st quarterly
03/27/12	Chronic *P. promelas*	>100	>100	100 SG	100	1		
06/05/12	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	2nd quarterly
06/05/12	Chronic *P. promelas*	>100	>100	100 SG	98	1		
09/11/12	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	3rd quarterly
09/11/12	Chronic *P. promelas*	>100	>100	100 SG	98	1		
10/16/12	Chronic *C. dubia*	>100	24	100 S **15.5 R**	100	6.5	EA	4th quarterly
10/16/12	Chronic *P. promelas*	>100	>100	100 SG	100	1		
11/13/12	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	Retest
04/23/13	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	6th quarterly
04/23/13	Chronic *P. promelas*	>100	>100	100 SG	95	1		
07/23/13	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	7th quarterly
07/23/13	Chronic *P. promelas*	>100	>100	100 SG	100	1		
12/17/13	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	8th quarterly
12/17/13	Chronic *P. promelas*	>100	>100	100 SG	95	1		
06/17/14	Chronic *C. dubia*	>100	>100	100 SR	100	1	EA	1st annual
06/17/14	Chronic *P. promelas*	>100	>100	100 SG	80	1		
08/25/15	Chronic *C. dubia*	>100	>100	100 S 65 R	98	1.5	EA	2nd annual
08/25/15	Chronic *P. promelas*	>100	>100	100 SG	95	1		

FOOTNOTES:

A **boldfaced** LC50 or NOEC value indicates that the test failed the toxicity criterion.

ABBREVIATIONS:

S – Survival; R – Reproduction; G – Growth
% SURV – Percent survival in 100% effluent
CBI – Coastal Bioanalysts, Inc
EA – EA Engineering, Science and Technology, Inc

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 12/13/13
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — Use as LC_{50} in Special Condition, as TUa on DMR

ACUTE	100% =	NOAEC	LC_{50} =	NA	% Use as	NA	TUa
ACUTE WLAa		0.319038	Note: Inform the permittee that if the mean of the data exceeds this TUa:	1.0		a limit may result using STATS.EXE	

Chronic Endpoint/Permit Limit — Use as NOEC in Special Condition, as TUc on DMR

CHRONIC	3.19038008	TU_c	NOEC =	32	% Use as	3.12	TU_c
BOTH*	3.19038008	TU_c	NOEC =	32	% Use as	3.12	TU_c
AML	3.19038008	TU_c	NOEC =	32	% Use as	3.12	TU_c

Enter data in the cells with blue type:

Entry Date:	08/10/16	ACUTE WLAa,c	3.19038	Note: Inform the permittee that if the mean	
Facility Name:	Wilderness WWTP	CHRONIC WLAc	7	of the data exceeds this TUc:	1.31106969
VPDES Number:	VA0083411	* Both means acute expressed as chronic		a limit may result using STATS.EXE	
Outfall Number:	1				

		% Flow to be used from MIX.EXE	Diffuser /modeling study?	
			Enter Y/N	n
Plant Flow:	2 MGD			
Acute 1Q10:	7.6 MGD	1.67 %	Acute	1 :1
Chronic 7Q10:	12 MGD	100 %	Chronic	1 :1

Are data available to calculate CV? (Y/N)	N	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	N	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWC_a	94.03268576 %	Plant flow/plant flow + 1Q10	NOTE: If the IWCa is >33%, specify the
IWC_c	14.28571429 %	Plant flow/plant flow + 7Q10	NOAEC = 100% test/endpoint for use
Dilution, acute	1.06346	100/IWCa	
Dilution, chronic	7	100/IWCc	
WLA_a	0.319038	Instream criterion (0.3 TUa) X's Dilution, acute	
WLA_c	7	Instream criterion (1.0 TUc) X's Dilution, chronic	
$WLA_{a,c}$	3.19038	ACR X's WLA_a - converts acute WLA to chronic units	
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)	
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)	
Constants eA	0.4109447	Default = 0.41	
eB	0.6010373	Default = 0.60	
eC	2.4334175	Default = 2.43	
eD	2.4334175	Default = 2.43 (1 samp) No. of sample 1	

**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

$LTA_{a,c}$	1.311069752	WLAa,c X's eA						Rounded NOEC's		%
LTA_c	4.2072611	WLAc X's eB								
MDL** with $LTA_{a,c}$	3.190380078	TU_c	NOEC =	31.344228	(Protects from acute/chronic toxicity)			NOEC =	32	%
MDL** with LTA_c	10.23802279	TU_c	NOEC =	9.767511	(Protects from chronic toxicity)			NOEC =	10	%
AML with lowest LTA	3.190380078	TU_c	NOEC =	31.344228	Lowest LTA X's eD			NOEC =	32	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

								Rounded LC50's		%
MDL with $LTA_{a,c}$	0.319038008	TU_a	LC50 =	313.442278	%	Use NOAEC=100%		LC50 =	NA	%
MDL with LTA_c	1.023802279	TU_a	LC50 =	97.675110	%			LC50 =	98	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA
(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB
(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC
(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD
(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1			1	
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	
11			11	
12			12	
13			13	
14			14	
15			15	
16			16	
17			17	
18			18	
19			19	
20			20	
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA NEED DATA
Mean	0	0	Mean	0 0
Variance	0	0.000000	Variance	0 0.000000
CV	0		CV	0

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 3. Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA %LC_{50} NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	76.3	1.31107		
Dilution series to use for limit			32	3.125
Dilution factor to recommend:	0.8733476		0.5656854	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	87.3	1.15	56.6	1.77
	76.3	1.31	32.0	3.13
	66.6	1.50	18.1	5.52
	58.18	1.72	10.2	9.77
Extra dilutions if needed	50.81	1.97	5.8	17.26
	44.37	2.25	3.3	30.52

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Attachment 11

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Orange County, Virginia.

PUBLIC COMMENT PERIOD: XXX, 2016 to XXX, 2016

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Rapidan Service Authority, PO Box 148, Ruckersville, VA 22968, VA0083411

NAME AND ADDRESS OF FACILITY: Wilderness WWTP, 36075 Wilderness Shores Way, Locust Grove, VA 22508

PROJECT DESCRIPTION: The Rapidan Service authority has applied for a reissuance of a permit for the public Wilderness WWTP. The applicant proposes to release treated sewage wastewaters from residential at a rate of 2.0 million gallons per day into a water body. Sludge from the treatment process will be used land applied through a permitted contractor. The facility proposes to release the treated sewage in the Rapidan River in Orange County in the Rappahannock watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, $cBOD_5$, Total Suspended Solids, Total Residual Chlorine, Dissolved Oxygen, *E. coli*, Total Nitrogen, Total Kjeldahl Nitrogen, Total Phosphorus, and Total Recoverable Zinc. The facility shall monitor without limitation for Total Hardness, Flow, Nitrate+Nitrite, and Whole Effluent Toxicity.

spaces ?

This facility is subject to the requirements of 9VAC25-820 and has registered for coverage under the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Watershed in Virginia.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by hand-delivery, e-mail or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the draft permit and application at the DEQ-Northern Regional Office by appointment, or may request electronic copies of the draft permit and fact sheet.
Name: Alison Thompson
Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193
Phone: (703) 583-3834 E-mail: alison.thompson@deq.virginia.gov